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ABSTRACT:

PROBLEM TO BE SOLVED: To obtain a low-density printing paper with good flexibility while retaining its mechanical strength.

SOLUTION: This printing paper is obtained by coating or impregnating a paper containing a low-density filler with an urea-containing surface treatment agent.

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Notes:

1. Untranslatable words are replaced with asterisks (****).
2. Texts in the figures are not translated and shown as it is.

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Dictionary: Last updated 03/28/2008 / Priority: 1. Chemistry / 2. JIS (Japan Industrial Standards) term / 3. Mathematics/Physics

FULL CONTENTS

[Claim(s)]

[Claim 1] The plasticity print sheet characterized by containing the low density loading material and urea of 0.3g/ml or less of relative bulk density.

[Claim 2] The plasticity print sheet according to claim 1 characterized by containing 15 or less weight % more than per weight % per weight for paper, and urea for the low density loading material of 0.3g/ml or less of relative bulk density 20 or less weight % of 0.1 weight % [per opposite pulp] or more.

[Claim 3] The plasticity print sheet according to claim 1 or 2 characterized by making the finishing agent which contains urea and an osmosis assistant in the paper containing the low density loading material of 0.3g/ml or less of relative bulk density contain according to a coating or sinking in.

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to a print sheet with a low density and plasticity.

[0002]

[Description of the Prior Art] The comic book and the paperback have spread rapidly reflecting a lack of interest in reading in recent years. Paper is also asked for grant of a weight saving or plasticity in connection with this. The weight saving of paper refers to the weight saving (bulky-izing), i.e., the reduction in a density, after maintaining the thickness of paper. Also when utilizing effectively the paper pulp manufactured from forest resources now when environmental protection is cried for, the weight saving of paper is the problem which cannot be bypassed. Moreover, plasticity grant refers to the suppleness of the paper which can fully

maintain the state where it opened, without closing automatically, when the flexural rigidity of paper, i.e., a book, is opened after maintaining the thickness of paper.

[0003] As the method of the reduction in the density of paper The methods (JP,H4-185792,A etc.) of using ***** pulp, and the method of depending on mixing with a synthetic fiber (JP,H3-269199,A etc.), There are a method of using fizz grains, the methods (JP,H3-269199,A etc.) of filling packing, such as an inorganic substance, among pulp (JP,H5-230798,A, JP,H11-200282,A, etc.), etc. However, use of bridge formation pulp, a synthetic fiber, etc. will make recycling of paper impossible. Moreover, by the method of filling packing indicated by the method of using fizz grains between pulp, and the above-mentioned gazette, if the amount of addition is made to increase at the same time paper durability declines remarkably, problems, such as powder omission at the time of printing, will also be produced.

[0004] Moreover, the methods (WO 98/No. 03730 gazette, JP,H11-200283,A, JP,H11-200284,A, JP,H11-200285,A, JP,H11-269799,A, etc.) of using a bulky agent are also reported as the low density-ized method of paper. while maintaining paper durability by these methods - low -- although density paper is obtained, it is not enough for plasticity discovery of paper.

[0005] On the other hand, it is thought that many factors, such as a kind of fiber, a density of paper, and moisture of paper, participate in fiber, and discover the plasticity of paper. Since moderate softness is required on the use, many softening agents are developed until now and, as for a paper product for home use, for example, toilet paper, tissue paper, etc., glycerol, a paraffin emulsification thing, invert sugar, etc. are known. If these softening agents also make the amount of addition increase, the fall of paper durability will be caused and it will become the cause of the trouble of the slip of paper at the time of printing etc.

[0006] Although applying water soluble polymers, such as starch, for the purpose of preventing the fall of low density-ized medicine, the paper durability by addition of a softening agent, or surface hardness is also considered, in order to obtain sufficient hardness, much coverage is needed, the reduction in a density made into the purpose and discovery of the softening effect are barred, and it is not desirable.

[0007]

[Problem(s) to be Solved by the Invention] The technical problem of this invention is offering the print sheet which is a low density and is excellent in plasticity, without reducing hardness.

[0008]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, as a result of inquiring wholeheartedly, by making the low density loading material and urea of 0.3g/ml or less of relative bulk density contain, this invention persons are low densities, and are excellent in plasticity, find out that the paper in which the fall of paper durability is still smaller is obtained, and came to complete this invention.

[0009]

[Embodiment of the Invention] This invention is explained in detail below.

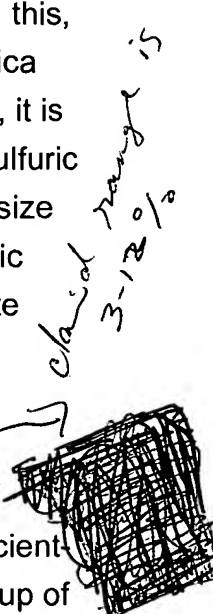
[0010] The relative bulk density (apparent density gravity; the putting-gently method) of the low density loading material used by this invention makes it indispensable to be 0.3g/ml or less. It will not be concerned with the pulp which will be used if relative bulk density is larger than this, but a density will increase. As a low density loading material of this invention, formless silica and formless silicate are desirable. Formless silica is a kind of synthetic amorphous silica, it is also called white carbon and water silicic acid, makes sodium silicate (water glass) and sulfuric acid react as a typical process, and is manufactured as floc (SiO_2 and nH_2O) with a grain size of about 5-20 micrometers. Moreover, call formless silicate silicate, such as other inorganic compounds, for example, the hydrated-Al-silicates compound by making aluminium sulfate react with sodium silicate etc., at the time of the above-mentioned reaction, and [with the presentation] There are hydrated Al silicates, hydrated-Al-silicates soda, a water calcium silicate, water magnesium silicate, etc.

[0011] As a loading material for paper manufacture, small-quantity (3 or less weight %) combination of formless silica and the formless silicate is usually carried out as the coefficient of-friction improver of a newsprint, and a printing opacity improver. [with the hydroxyl group of a large number which formless silica and amorphous silicate are manufactured at by adding sulfuric acid to sodium silicate as the typical manufacture method as mentioned above, and have a primary particle in the surface] It is thought that it is having structure which condensed gradually and became a three-dimensional structure object (aggregated particle) carrying out a hydrogen bond. Thus, since it has many pores although it is floc therefore, it is thought that it is a low density. Although this invention persons were the secondary flocs which formless silica and formless silicate mentioned above, they paid their attention to the loft resulting from the numerousness of the amounts of pores of a reason.

[0012] The urea used by this invention enters between pulp fiber, and gives plasticity to paper by checking the hydrogen bond between fiber. Although a coating or the externally adding method which sinks in can be considered as the addition method of urea after the internal method added in pulp at the time of paper making, and paper making and both can acquire a flexible effect, since the yield is especially high by an externally adding method, a high flexible effect can be acquired.

[0013] Although the reduction in a density is possible by adding a low density loading material, the effect about softening is not necessarily enough and paper durability also declines. On the other hand, when only urea is added, it follows on making the amount of addition increase, and a flexible effect becomes high, but the thing to which most density falls of paper are not seen but the amount of addition is made to increase and for which the reduction in a density and softening are reconciled since it is rich and the density of a filter paper rises is difficult.

[0014] Then, it found out that the paper in which a low density and plasticity have been



improved more effectively could be manufactured, maintaining the hardness of paper at practically sufficient grade by using it combining a low density loading material and urea, as a result of considering an improvement of the hardness of paper, a density, and plasticity.

[0015] As a method of making urea containing as mentioned above, a coating or the externally adding method by sinking in is desirable. therefore, urea after the desirable mode for obtaining the plasticity print sheet of this invention adds a low density loading material in the usual paper-making process (what is called internal) -- a coating -- or what is necessary is just to sink in urea -- a coating -- or the usual coating method can be used and what is necessary is just to use 2 roll size press coater, gate roll coater, blade metaling coater, rod metaling coater, etc., in order to sink in

[0016] Moreover, when making paper contain urea according to a coating or sinking in, in order to promote osmosis on the paper of urea, it is desirable to use an osmosis assistant with urea. Although the ethyleneoxide polymerization thing which is the usual non-ion system surface active agent, a propylene oxide polymerization thing, an ethylene oxide propylene oxide copolymerization thing, etc. are mentioned as an osmosis assistant If it is possible to promote osmosis on the paper of urea, it will not be limited to such a medicine. As for an osmosis assistant, it is desirable to use in 10 or less weight % of the range 0.1weight % or more to urea.

[0017] The amount of addition of a low density loading material has 20 or less weight % more than per weight % per paper weight of a desirable range, and its the 4-weight % or more 15 or less weight % of range is especially desirable. As for a low density-ized effect, less than 1 weight % is not enough as the amount of addition of a low density loading material, and if the amount of addition exceeds 20 weight %, the fall of paper durability will become remarkable. Moreover, you may make loading materials other than a low density loading material contain in the range in which desired low density-ization is obtained. Although what is generally used as a loading material can be used and it is not limited in particular For example, Clay, calcination Clay, a diatom earth, a talc, kaolin, calcination kaolin, DERAMI kaolin, whiting, precipitated calcium carbonate, magnesium carbonate, Barium carbonate, titanium dioxide, zinc oxide, a silicon oxide, amorphous silica, Organic loading materials, such as inorganic loading materials, such as aluminium hydroxide, a calcium hydroxide, magnesium hydroxide, and zinc hydroxide, urea-formalin resin, polystyrene resin, a phenol resin, and minute hollow grains, are used combining two or more kinds independently or suitably.

[0018] The amount of addition of urea has 20 or less weight % of 0.1 weight % [per opposite pulp] or more of a desirable range, and its the 1-weight % or more 10 or less weight % of range is especially desirable. A flexible effect is not enough in the amount of addition being less than 0.1 weight %, and if it exceeds 20 weight %, while strength reduction will become large as compared with a flexible effect, it is not desirable in order to also cause the increase in

a density.

[0019] Although the Reason a strong fall can manufacture a low density and flexible and small paper by using together a low density loading material and urea is not clear [cutting urea and making flexible the direct hydrogen bond between fiber of cellulose, while a low density loading material increases the distance between fiber and discovers a low density-ized effect] Since a hydrogen bond can be formed, it thinks for constructing a bridge indirectly and holding hardness, and both are imagined to demonstrate the effect by the complicated interaction by using together.

[0020] The plasticity print sheet of this invention is manufactured by the usual paper manufacture process from various pulp. raw material pulp -- chemical pulp (** of a needle-leaf tree, or non-bleached kraft pulp --) Mechanical pulp (grand pulp, thermomechanical pulp, chemithermomechanical pulp, etc.), such as ** or non-bleached kraft pulp of a broadleaf tree, deinking pulp, etc. can be mixed and used at an independent or arbitrary rate.

[0021] What is necessary is just to carry out the coating (what is called externally adding) of urea and the osmosis assistant, after adding low density-ized medicine at the usual paper-making process (what is called internal), in order to obtain the paper containing the low density-ized medicine, urea, and the osmosis assistant of this invention. The place which adds low density-ized medicine will not be limited especially if it is a place mixable with pulp slurry to homogeneity.

[0022] In the range which does not affect the reduction in a density, and plasticity when manufacturing the plasticity print sheet of this invention You may use internal assistants for paper manufacture currently used from the former, such as various kinds of nonionicity, a cationic and anionic yield improver, a freshness improver, a paper durability improver, and an internal sizing agent agent, if needed, choosing them suitably.

[0023] As an internal assistant for paper manufacture, a sulfuric acid band, aluminium chloride, sodium aluminate, Water-soluble aluminium compounds, such as basic aluminium compound; alumina sols, such as a basic aluminum chloride and basic Pori aluminium hydroxide; Ferrous sulfate, Polyvalent metal compounds, such as ferric sulfate, starch, modified starch, polyacrylamide, A urea resin, a melamine resin, an epoxy resin, polyamide resin, polyamide, Polyamine resin, polyamine, polyethyleneimine, vegetable gum, polyvinyl alcohol, Being able to illustrate various compounds, such as water soluble polymers, such as latex and polyethylene oxide, hydrophilic crosslinked polymer grain dispersed matters and these derivatives, or a conversion thing, these substances have simultaneously some of functions as said internal assistant for paper manufacture.

[0024] Next, as what has a remarkable function as an internal sizing agent agent, an alkyl ketene dimer system compound, an ARUKENIRU succinic anhydride system compound, a styrene acrylic compound, a higher fatty acid system compound, a petroleum resin system

sizing compound, and a rosin system sizing compound are mentioned.

[0025] Furthermore, according to a use, you may also add suitably assistants for paper manufacture, such as a color, a fluorescent brightener, a pH adjuster, a defoaming agent, a pitch controller, and a slime control agent. [in addition, the manufacture method of the plasticity print sheet of this invention] The paper-making method will not be based on acid paper making for example, whose paper making pH is the 4.5 neighborhoods. Or it is aimed at what paper making pH depends what is called on neutral paper making performed with about 6 weak acidity - about 9 alkalinescence, and the paper which is not limited especially for ***** but is obtained by all the paper-making methods, including alkaline loading materials, such as calcium carbonate, as a principal component. Moreover, a paper machine can also use suitably a Fourdrinier machine, a twin wire machine, a Yankee machine, etc.

[0026] Moreover, in the range in which the desired reduction in a density and desired plasticity are acquired, in order to improve surface hardness and size nature, you may coat a finishing agent. As a finishing agent, starch, modified starch, polyacrylamide, polyvinyl alcohol, Carboxymethylcellulose, styrene / acrylic acid copolymer, styrene / acrylic acid / acrylic ester copolymer, styrene/maleic acid copolymer, styrene / butadiene copolymer, etc. are illustrated. In addition, assistants, such as a non-skid agent, antiseptics, a defoaming agent, a viscosity controlling agent, and a color, can also be used together. In the case of the coating of a finishing agent, you may coat urea and an osmosis assistant simultaneously.

[0027] The plasticity print sheet of this invention is suitable as an offset printing paper, in addition can be used as the Toppan Printing paper, a gravure paper, and an electrophotography paper. Moreover, it can be used also for stencil paper, such as coated paper, an ink-jet archival paper, a thermographic recording paper, and pressure-sensitive recording paper.

[0028]

[Example] Although a work example explains this invention in detail below, this invention is not limited to this. About the paper manufactured by the work example and the comparative example, the grade of the reduction in a density was a density, the Clark stiffness estimated plasticity and paper durability was evaluated by tearing strength and surface hardness. The measuring method followed below.

[0029] Density: JIS P It measured according to 8118.

[0030] Tearing strength: JIS P According to 8116, it measured about the paper-making cross direction.

[0031] Clark stiffness: JIS P According to 8143, it measured about the paper-making cross direction.

[0032] Surface hardness: As an offset press Using a Roland R2020B sheet offset press, ink is red (trade name: [TY-high-plus-LZ and]). Using the Toyo Ink make and two colors of

Japanese ink (trade name: TY high plus LZ, Toyo Ink make), [6000 copies/hour of press speed] Visual evaluation of the state of the powder omission to the blanket after printing so that solid part printing concentration may become Japanese ink 1.1 and red 1.0, and printing 4000 copies, and the printing quality was carried out. if the printing debasement considered to be based on the state of the powder omission of a blanket and the powder omission to a blanket is comparative example 1 level -- O -- when slightly bad, it was considered as **.

[0033] [Work example 1] LBKP (freeness CSF350ml) was used as a part for pulp. It is as a loading material considering calcium carbonate (0.37g/ml relative bulk density) as 15 weight % per paper weight, and a low density loading material. Formless silica (0.25g/ml relative bulk density) 10 weight % per paper weight, As a neutral sizing agent agent, the alkyl ketene dimer (trade name: made in AS-263 and Japan PMC) was added so that it might become 0.2 weight % per paper weight, pulp was prepared, paper making was carried out by a part for 50m of speed/with the test paper machine, and stencil paper with a thickness of paper of 130 micrometers and a basis weight of 70g/m² was obtained. Next, to this stencil paper, the aqueous solution of 19 weight % of solid content concentration which consists of a urea 50 weight part and the starch (trade name: SK-20, product made from Japanese cornstarch) 100 weight part for coatings was coated so that it might become the amount of coatings of 6.0g/m² with 2 roll size press machine, and the plasticity print sheet was manufactured. The density of the obtained plasticity print sheet, the Clark stiffness, tearing strength, and surface hardness were measured, and the result was shown in Table 1.

[0034] [Work example 2] Become the amount of coatings of 8.0g/m² with 2 roll size press machine about the aqueous solution of 25 weight % of solid content concentration which consists of a urea 100 weight part and the starch 100 weight part for coatings. Except having coated, the plasticity print sheet was manufactured like the work example 1, a density, the Clark stiffness, tearing strength, and surface hardness were measured, and the result was shown in Table 1.

[0035] [Work example 3] A urea 50 weight part, osmosis assistant (trade name: my NEKKUSU SO) Except having coated the aqueous solution of 14.3 weight % of solid content concentration which consists of a product made from Akinari chemistry 2.5 weight part, and the starch 100 weight part for coatings so that it might become the amount of coatings of 6.0g/m² with 2 roll size press machine The plasticity print sheet was manufactured like the work example 1, a density, the Clark stiffness, tearing strength, and surface hardness were measured, and the result was shown in Table 1.

[0036] [Work example 4] It is as a loading material considering calcium carbonate (0.37g/ml relative bulk density) as 15 weight % per paper weight, and a low density loading material. Except having added formless silicate (hydrated-Al-silicates soda, 0.25g/ml relative bulk density) to pulp so that it might become 10 weight % per paper weight, the plasticity print sheet

was manufactured like the work example 1, a density, the Clark stiffness, tearing strength, and surface hardness were measured, and the result was shown in Table 1.

[0037] [Comparative example 1] Except having coated the aqueous solution of 13 weight % of solid content concentration which consists only of the starch for coatings so that it might become the amount of coatings of 4.0g/m² with 2 roll size press machine, the print sheet was manufactured like the work example 1, a density, the Clark stiffness, tearing strength, and surface hardness were measured, and the result was shown in Table 1.

[0038] [Comparative example 2] As a loading material, except having added calcium carbonate (0.37g/ml relative bulk density) to pulp so that it might become 25 weight % per paper weight, the print sheet was manufactured like the work example 1, a density, the Clark stiffness, tearing strength, and surface hardness were measured, and the result was shown in Table 1.

[0039] [a comparative example 3] -- it becomes 25 weight % per paper weight about calcium carbonate (0.37g/ml relative bulk density) as a loading material -- as It added to pulp, and except having coated the aqueous solution of 13 weight % of solid content concentration which consists only of the starch for coatings so that it might become the amount of coatings of 4.0g/m² with 2 roll size press machine, the print sheet was manufactured like the work example 1, a density, the Clark stiffness, tearing strength, and surface hardness were measured, and the result was shown in Table 1.

[0040]

[Table 1]

表 1

	塗工量 (g/m ²)	尿素塗工量 (対パルプ%)	密度 (g/cm ³)	クラーク剛度 (cm ³ /100)	引裂強さ (mN)	表面強度
実施例 1	6.0	3.8	0.57	43.4	432	○
実施例 2	8.0	7.6	0.58	37.5	450	○
実施例 3	6.0	3.8	0.57	43.8	430	○
実施例 4	6.0	3.8	0.57	43.2	433	○
比較例 1	4.0	0	0.56	56.2	419	○
比較例 2	4.0	3.8	0.61	55.7	431	○
比較例 3	4.0	0	0.62	60.2	443	○

if the work examples 1-4 which applied urea to the paper containing a low density loading material are compared with the comparative example 3 which did not contain a low density loading material and urea, but applied only starch to paper as shown in Table 1 -- both tearing strength and surface hardness -- although -- without it falls A density and the Clark stiffness fell and the paper which is supplied by a low density was obtained. Moreover, the comparative

example 2 which coated urea on the paper which does not contain a low density loading material has the inadequate reduction in a density, and most Clark stiffness is not falling. Furthermore, although the density fell, the fall of the Clark stiffness of the comparative example 3 which coated only starch on the paper which did not contain urea but contained the low density loading material was inadequate, and tearing strength also fell [the comparative example].

[0041] While the amount of coatings of urea increases from work examples 1 and 2, it is clear that the Clark stiffness falls. By comparison of a work example 1 and a work example 3, since the permeability to the paper of urea improves by osmosis assistant addition, in order to obtain the amount of the same coatings, the solid content concentration of a coating slip can be fallen. Thus, the reduction in a density and softening of paper can be attained by coating urea on the paper containing low density-ized medicine, maintaining the hardness of paper.

[Translation done.]